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Minneapolis, MN 55401

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September 1, 2020

—Via Electronic Filing—

Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101

RE: 2021 VOS CALCULATION
COMMUNITY SOLAR GARDENS PROGRAM
DOCKET NO. E002/M-13-867

Dear Mr. Seuffert:

Northern States Power Company, doing business as Xcel Energy, submits this Value of Solar (VOS) calculation for vintage year 2021.[1]

The levelized rate for the 2021 VOS Vintage Year Bill Credit Rate is calculated to be 11.04 cents per kWh. This compares to a levelized rate of 11.52 cents per kWh for the 2020 VOS Vintage Year Bill Credit Rate. On an annual basis (non-levelized), the bill credit for the 2021 VOS Vintage Year ranges from 9.11 cents per kWh for production in Year 1 to 15.04 cents per kWh for production in Year 25. This calculation represents a per kWh decrease of 0.29 cents for year 1 and decrease of 0.92 cents in year 25 from the 2020 VOS Vintage calculation of 9.40 cents per kWh in the first year and 15.96 cents per kWh in the final year. The decrease in pricing is primarily driven by a lower NYMEX fuel cost and is partially offset by the net impact of a host of other input updates that result in smaller adjustments.

We provide as Attachment M proposed tariff sheets to implement the 2021 VOS Vintage Year Bill Credit Rates as part of the Solar*Rewards Community program.

[1] Once approved, the 2021 VOS Vintage Year Bill Credit Rate table is applicable to applications deemed complete from the date of the filing of the tariff containing this rate table until the 2022 VOS Vintage Year Bill Credit Rate table is effective. The 2021 VOS Vintage Year Bill Credit Rate table is applied for the 25 years of subscribed production from the gardens associated with this rate table.

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Below is a list of the attachments included in the 2021 VOS filing:

- Attachment A – 2021 VOS Model LIVE
- Attachment B – 2021 Distribution Capacity Value LIVE
- Attachment C – Fleet Data LIVE
- Attachment D – Fuel Price Overhead LIVE TRADE SECRET
- Attachment E – PLR LIVE
- Attachment F – Loss Saving Energy LIVE
- Attachment G – ELCC and Loss Savings LIVE
- Attachment H – NYMEX NG Forward Pricing 2021-32 LIVE
- Attachment I – Transmission Capacity MISO OATT 5YR Calculation LIVE
- Attachment J – 2020 Treasury Rates LIVE
- Attachment K – General and Fuel Price Escalation LIVE
- Attachment L – Environmental Costs LIVE
- Attachment M – Tariff Sheets
- Attachment N – List of Input Changes
- Attachment O – Production Data LIVE

Please note, Attachment D contains Not Public information protected by the Minnesota Data Practices Act. That information has economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by other persons and is subject to efforts by the Company to protect the information from public disclosure. Xcel Energy maintains this information as a trade secret based on its economic value from not being generally known and not being readily ascertainable by proper means by other persons who can obtain economic value from its disclosure or use. For this reason, we ask that the data be treated as non-public data pursuant to Minn. Stat. § 13.37, subd. 1(b).

A. Filing Requirements

The VOS calculations are filed in compliance with Order Point 3 of the Commission's March 4, 2020 Order (2020 Order), and Order Point 1 of the Commission's December 3, 2019 Order (2019 Order). Order Point 3 of the 2020 Order requires the Company to do the following:

a. File by September 1.
b. Include in the filing:

i. A list of all changed parameters as permitted by the approved VOS Methodology, and any updated input values;
ii. A discussion, along with any necessary tables, charts, and explanations, of how these changes will affect the VOS rate, as well as variables within the rate;
iii. Hourly PV fleet production data for PV systems 1 MW and under in the utility service territory, including:
    1. synchronized, time-stamped hourly values of average power over the same load analysis period and corresponding to the same hourly intervals,
    2. data for every hour of the load analysis period, and
    3. a load analysis period including multiple contiguous years, with complete one-year periods, using available and correct data; and
iv. Sufficient evidence and data to support these changes.

c. Convene a meeting no later than August 1, 2020 to explain in detail to those in attendance each of the items identified above. Topics at the meeting must also include:
    i. How the solar-weighted heat rate is determined,
    ii. Avoided plant operations and maintenance costs, and
    iii. Avoided generation capacity costs.

Order Point 1 of the 2019 Order requires the Company to do the following:

> The Commission approves Xcel's proposed methodology for calculating the avoided distribution cost component for the 2020 VOS rate applied to the CSG program, except for the 50% deferral-reduction factor.
>
> a. If Xcel proposes a deferral-reduction factor for the 2021 VOS rate, the Company shall provide additional supporting evidence in its September 1, 2020 VOS annual compliance filing. Such evidence should include an evaluation of solar project locations (both CSG and other distributed solar projects if possible) compared to the locations of deferrable distribution investments made over the past five years and planned within the next three to five years.
>
> b. Xcel shall report annually on its planned and actual distribution spending, along with the placement of CSGs to assist with evaluating Xcel's avoided distribution cost calculation methodology for possible future use in locational differentiation.

The date of this filing is September 1, 2020, in compliance with Order Point 3a noted above. In compliance with Order Point b of the Commission's 2019 filing noted above, the Company reports planned and actual distribution spending in Attachment B of this filing, and the placement of CSGs is reported in Attachment C of the Company's Annual Report for Community Solar Gardens, filed April 1st each year. Our compliance with the remainder of the Order is provided below.

B. VOS Input Parameters

a. A list of all changed parameters as permitted by the approved VOS Methodology, and any updated input values.

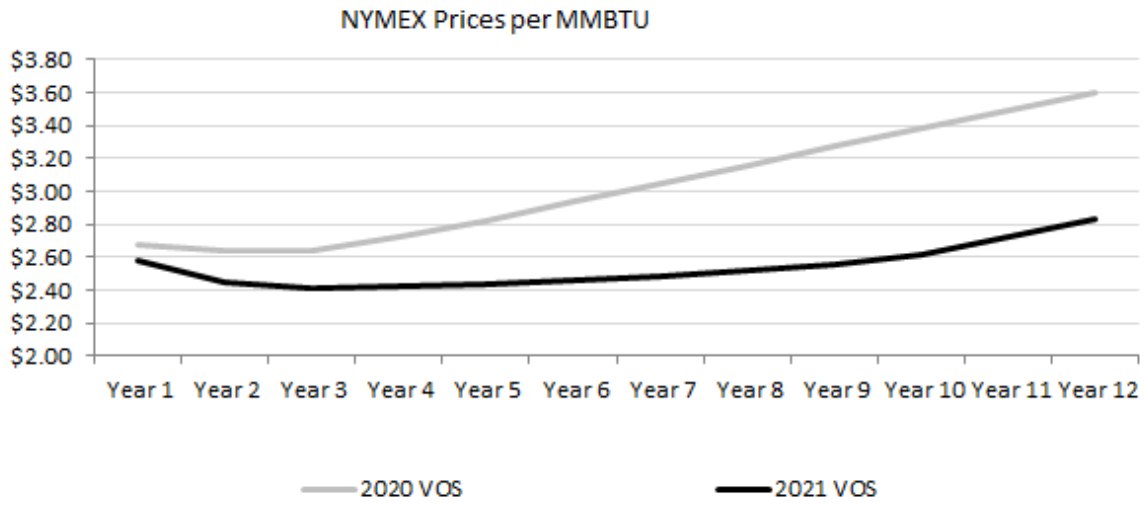
Please see Attachment N for a list of input changes, reasons for the change and the impact of the change.

b. A discussion—along with any necessary tables, charts, and explanations—of how these changes will affect the VOS rate, as well as variables within the rate.

Most of the changes to the VOS inputs represent an update of annual data due to the passage of time and have a minimal impact on the VOS calculation results. In this section we discuss the major driver of the price change from the 2020 VOS as well as our approach to several data inputs for this filing.

i. VOS Price Change Driver: Avoided Fuel Cost Update

The Company refreshed the avoided fuel pricing consistent with the VOS methodology and our approach in prior years, using the NYMEX NG futures with a fixed escalation for years beyond the 12-year trading period. This year's update reflects a significant drop in natural gas pricing. Avoided fuel costs make up more than 20 percent of the VOS (levelized), and thus a material reduction in NYMEX pricing puts downward pressure on the VOS. This update is the major driver in lower VOS pricing for the 2021 vintage. The chart below illustrates the drop in natural gas prices.



ii. Hourly PV Fleet Production Data

For the 2021 VOS calculation, the Company updated our approach for calculating the PV Energy Production through the use of an Hourly PV Fleet Production analysis.[2] This analysis utilizes available data from PV Systems 1 MW and smaller, including Community Solar Gardens, Solar*Rewards, and customer sited solar with production meters for the period of 2017 through 2019. This timeframe was chosen because full year hourly production data for solar systems prior to 2017 is less complete. The production data sets were organized by resource, synchronized by time-stamped interval the energy was produced. The load and loss data are structured in the same manner as resource data identified above.

	Community Solar Gardens	**Solar*Rewards (S*R)**	**Customer Sited Solar with Production Meters**
Maximum Number of Production Meters with Data Available for Analysis	683	180	88
Maximum MW (over load analysis period)	608	2.3	12
Notes:		Meters included represent the load research installed production meters. Typical S*R installations do not have production meters.	

[2] The Company provides Attachment O, Hourly PV Fleet Production data, in compliance with Order Point 3.b.iii of the Commission's 2020 Order.

This approach resulted in a first-year annual energy input of 1,550 MWh/MW as shown in the table below:

	2017	2018	2019	3 Year Average
Capacity Factor	18.35%	17.80%	16.92%	17.69%
MWh/MW	1608	1559	1482	**1550**

iii. Avoided Distribution Costs

The Company has incorporated the five-year average of per-kW distribution spending to calculate the avoided distribution cost for the 2021 VOS rate, as approved by the Commission.[3] The Company is not proposing a deferral-reduction factor for the 2021 VOS rate.

iv. Solar Weighted Heat Rate (SWHR)

The Company continues to use the calculation laid out in the VOS Methodology. The PLEXOS generation production modeling software is used to run a base model simulation using the NSP system as currently modeled, including all natural gas generators available to the system, for a period of the upcoming year. A second model run (Free Solar) includes the sale base model plus the addition of 100 MW of solar, available at no cost to the system. The Free Solar model simulation incorporates the solar addition prior to dispatching natural gas generators, resulting in reduced natural gas generation. From these model runs, the SWHR is calculated as follows:

The BASE simulation data is used to determine the base single year heat rate:

BASE Total Natural Gas Fuel input (MMBTU) ÷ BASE Total Natural Gas Generation (MWh)

The FREE SOLAR simulation data is used to determine the change case first year heat rate:

FREE SOLAR Total Natural Gas Fuel input (MMBTU) ÷ FREE SOLAR Total Natural Gas Generation (MWh)

The SWHR uses the fuel input of the BASE output and the natural gas generation of the FREE SOLAR output.

BASE Total natural gas fuel input (MMBTU) ÷ FREE SOLAR total natural gas generation (MWh)

[3] December 3, 2019 Order, Docket Nos. E-999/M-13-867 and E-999/M-14-65.

All natural gas units are included in these modeling runs; this includes Company owned units as well as power purchase agreements for combustion turbines and combined cycle units. The model output is reflective of a single year of operation, therefore the heat rates reflected are for Year 1. Subsequent heat rate degradation is addressed in the VOS Methodology through the Heat Rate Degradation Factor.

Changes to the SWHR will impact Avoided Fuel Cost, Avoided Generation Capacity Cost, and Avoided Environmental Cost.

The table below identifies the modeled outputs and SWHR calculation for both 2021 VOS and the prior year 2020 VOS.

		2021 VOS SWHR		2020 VOS SWHR	
		Base Case	Free Solar	Base Case	Free Solar
MMBTU NG	(A)	67,720	67,399	32,450	32,275
NG GWh	(B)	8,977	8,935	4,214	4,191
Margin Plant HR	(C)=(A)/(B)	7.54	7.54	7.70	7.70

		SWHR	SWHR
Base NG MMBTU	(A1) BASE	67,720	32,450
FREE Solar NG MWh	(B1) FREE SOLAR	8,935	4,191
SWHR	(C1)=(A1)/(B1)	7.579	7.74
Input to VOS	(C1)*1000	7,579	7,742

The key driver in the change in the 2021 SWHR is the change in Base model natural gas production. The current modeling reflects the changes in coal operations, resulting in increased natural gas production. The lower SWHR implies a greater mix of CC generation production.

v. Avoided Plant Heat Rate, Capital, and O&M Costs (Fixed and Variable)

The VOS inputs related to generation capacity heat rate and cost, and operations and maintenance costs (fixed and variable) represent the next installed unit in the VOS Methodology. This data is updated and maintained to reflect recent and relevant technology improvements, and operational hours by the Energy Supply area of the Company. The most recent analysis was completed in early 2019 and are represented in 2018 dollars. These values are the basis for the 2020-2034 IRP generic unit modeling and are escalated from the base year 2018 to the evaluation period.

C. Stakeholder Discussion

The Company presented the 2021 Value of Solar preliminary calculation at the quarterly Solar*Rewards Community Implementation Workgroup hosted on July 29, 2020. The presentation detailed each of the items discussed above. The presentation will be filed with the meeting minutes in this docket once they are approved in an upcoming workgroup session.

We have electronically filed this document with the Minnesota Public Utilities Commission, and copies have been served on the parties on the attached service list. Please contact Nick Paluck at Nick.Paluck@xcelenergy.com or (612) 330-2905 or me at Lisa.R.Peterson@xcelenergy.com or (612) 330-7681 if you have any questions regarding this filing.

Sincerely,

/s/

LISA R. PETERSON
MANAGER, REGULATORY ANALYSIS

Enclosures
c: Service List

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Note: Table 1, 2 and 16 were not included as they are not required for the VOS calculation. Table 7 (Losses to be considered) are included in Fig. ES-1

Figure ES-1. VOS Calculation Table: economic value, load match, loss savings and distributed PV value

25 Year Levelized Values	Economic Value ($/kWh)	Load Match (No Losses) (%)	Distributed Loss Savings (%)	Distributed PV Value ($/kWh)
Avoided Fuel Cost	$0.0215		9.8%	$0.0236
Avoided Plant O&M - Fixed	$0.0028	48.7%	10.6%	$0.0015
Avoided Plant O&M - Variable	$0.0013		9.8%	$0.0014
Avoided Generation Capacity Cost	$0.0395	48.7%	10.6%	$0.0213
Avoided Reserve Capacity Cost	$0.0035	48.7%	10.6%	$0.0019
Avoided Transmission Capacity Cos	$0.0325	48.7%	10.6%	$0.0175
Avoided Distribution Capacity Cost	$0.0080	54.5%	3.1%	$0.0045
Avoided Environmental Cost	$0.0353		9.8%	$0.0387
Avoided Voltage Control Cost				
Solar Integration Cost				
TOTAL				**$0.1104**

Figure ES-2. 1st-Year VOS Rate calculation

Year	Discount Factor	Escalation Factor	**VOS Levelized**	Disc.	**VOS Inflation Adj. ($/kWh)**	Disc
2021	1.000	1.000	$0.110	$0.110	$0.0911	0.091
2022	0.940	1.021	$0.110	$0.104	$0.0931	0.087
2023	0.884	1.043	$0.110	$0.098	$0.0950	0.084
2024	0.831	1.065	$0.110	$0.092	$0.0970	0.081
2025	0.781	1.087	$0.110	$0.086	$0.0991	0.077
2026	0.735	1.110	$0.110	$0.081	$0.1012	0.074
2027	0.691	1.133	$0.110	$0.076	$0.1033	0.071
2028	0.649	1.157	$0.110	$0.072	$0.1055	0.069
2029	0.611	1.182	$0.110	$0.067	$0.1077	0.066
2030	0.574	1.207	$0.110	$0.063	$0.1100	0.063
2031	0.540	1.232	$0.110	$0.060	$0.1123	0.061
2032	0.508	1.258	$0.110	$0.056	$0.1147	0.058
2033	0.477	1.285	$0.110	$0.053	$0.1171	0.056
2034	0.449	1.312	$0.110	$0.050	$0.1196	0.054
2035	0.422	1.340	$0.110	$0.047	$0.1221	0.051
2036	0.397	1.368	$0.110	$0.044	$0.1247	0.049
2037	0.397	1.397	$0.110	$0.044	$0.1273	0.050
2038	0.351	1.426	$0.110	$0.039	$0.1300	0.046
2039	0.330	1.456	$0.110	$0.036	$0.1327	0.044
2040	0.310	1.487	$0.110	$0.034	$0.1355	0.042
2041	0.291	1.518	$0.110	$0.032	$0.1384	0.040
2042	0.274	1.550	$0.110	$0.030	$0.1413	0.039
2043	0.258	1.583	$0.110	$0.028	$0.1443	0.037
2044	0.242	1.616	$0.110	$0.027	$0.1473	0.036
2045	0.228	1.651	$0.110	$0.025	$0.1504	0.034
				$1.454		$1.461

Table 3. Fixed Assumptions to be used for the VOS calculations

Fuel Prices

Guaranteed NG Fuel Prices

2021	$2.579	$/mmBtu
2022	$2.446	$/mmBtu
2023	$2.414	$/mmBtu
2024	$2.419	$/mmBtu
2025	$2.432	$/mmBtu
2026	$2.457	$/mmBtu
2027	$2.482	$/mmBtu
2028	$2.516	$/mmBtu
2029	$2.552	$/mmBtu
2030	$2.614	$/mmBtu
2031	$2.721	$/mmBtu
2032	$2.826	$/mmBtu

Fuel Price Escalation	2.11%

PV Assumptions

PV Degradation Rate	0.50%
PV Life	25

Environmental Externalities

Environmental Discount Rate	5.17%	per year
Environmental Costs	separate table	

Economic Assumptions

General Escalation Rate	2.11%	per year

Treasury Yields

1 Year	0.21%
2 Year	0.26%
3 Year	0.31%
5 Year	0.42%
7 Year	0.60%
10 Year	0.73%
20 Year	1.18%
30 Year	1.40%

Table 4. Environmental costs by year.

Year	Analysis Year	CO2 Cost $/mmBtu	PM 2.5 Cost $/mmBtu	CO Cost $/mmBtu	NOx Cost $/mmBtu	Pb Cost $/mmBtu	SO2 Cost $/mmBtu	Total Cost $/mmBtu
2021	0	$2.860	$0.020	$0.000	$0.284	$0.000	$0.003	$3.168
2022	1	$2.975	$0.021	$0.000	$0.290	$0.000	$0.004	$3.289
2023	2	$3.094	$0.021	$0.000	$0.296	$0.000	$0.004	$3.415
2024	3	$3.216	$0.022	$0.000	$0.302	$0.000	$0.004	$3.544
2025	4	$3.342	$0.022	$0.000	$0.308	$0.000	$0.004	$3.676
2026	5	$3.472	$0.023	$0.000	$0.315	$0.000	$0.004	$3.813
2027	6	$3.606	$0.023	$0.000	$0.321	$0.000	$0.004	$3.954
2028	7	$3.744	$0.024	$0.000	$0.328	$0.000	$0.004	$4.100
2029	8	$3.886	$0.024	$0.000	$0.335	$0.000	$0.004	$4.249
2030	9	$4.033	$0.025	$0.000	$0.342	$0.000	$0.004	$4.404
2031	10	$4.200	$0.025	$0.000	$0.349	$0.000	$0.004	$4.579
2032	11	$4.373	$0.026	$0.000	$0.357	$0.000	$0.004	$4.760
2033	12	$4.551	$0.026	$0.000	$0.364	$0.000	$0.004	$4.946
2034	13	$4.735	$0.027	$0.000	$0.372	$0.000	$0.005	$5.138
2035	14	$4.924	$0.027	$0.000	$0.380	$0.000	$0.005	$5.336
2036	15	$5.119	$0.028	$0.000	$0.388	$0.000	$0.005	$5.540
2037	16	$5.321	$0.028	$0.000	$0.396	$0.000	$0.005	$5.750
2038	17	$5.528	$0.029	$0.000	$0.404	$0.000	$0.005	$5.967
2039	18	$5.742	$0.030	$0.000	$0.413	$0.000	$0.005	$6.190
2040	19	$5.963	$0.030	$0.000	$0.422	$0.000	$0.005	$6.420
2041	20	$6.170	$0.031	$0.000	$0.431	$0.000	$0.005	$6.637
2042	21	$6.383	$0.032	$0.000	$0.440	$0.000	$0.005	$6.859
2043	22	$6.602	$0.032	$0.000	$0.449	$0.000	$0.006	$7.089
2044	23	$6.828	$0.033	$0.000	$0.458	$0.000	$0.006	$7.325
2045	24	$7.060	$0.034	$0.000	$0.468	$0.000	$0.006	$7.568

Table 5. VOS Data table -- required format showing assumptions used in the VOS calculation.

	Input Data	Units
Economic Factors		
Start Year for VOS applicability	2021	Year
Discount Rate (After-tax WACC)	6.36%	Percentage
Load Match Analysis		
ELCC (no loss)	48.7%	% of rating
PLR (no loss)	54.5%	% of rating
Loss Savings - Energy	9.8%	% of PV output
Loss Savings - PLR	3.1%	% of PV output
Loss Savings - ELCC	10.6%	% of PV output
PV Energy		
Actual first year annual energy production	1,550	kWh per kW-AC
Transmission		
Capacity-related transmission capital cost	$49.98	$ per kW
Power Generation		
Peaking CT, simple cycle		
Installed Cost	$496	$/kW
Heat Rate	9,746	BTU/kWh
Intermediate CCGT		
Installed Cost	$1,067	$/kW
Heat Rate	6,472	BTU/kWh

	Input Data	Units
Power Generation - Continued		
Other		
Solar weighted Heat Rate	7,579	BTU per kWh
Fuel Price Overhead	-$0.051	$ per MMBtu
Generation life	40	years
Heat Rate degradation	0.10%	pear year
O&M cost (first year) - Fixed	$3.55	per kW-yr
O&M cost (first year) - Variable	$0.00105	$ per kWh
O&M cost escalation rate	2.00%	per year
Reserve planning margin	8.9%	
Years until new Generation is needed	0	
Distribution		
Capacity-related distribution capital costs -System	$248.30	$ per kW
Capacity-related distribution capital costs - Mpls	N/A	$ per kW
Capacity-related distribution capital costs - Mtka	N/A	$ per kW
Capacity-related distribution capital costs -Edina	N/A	$ per kW
Capacity-related distribution capital costs - SE	N/A	$ per kW
Capacity-related distribution capital costs -MG	N/A	$ per kW
Capacity-related distribution capital costs - Newport	N/A	$ per kW
Capacity-related distribution capital costs - St. Paul	N/A	$ per kW
Capacity-related distribution capital costs - NW	N/A	$ per kW
Capacity-related distribution capital costs - WBL	N/A	$ per kW
Distribution capital cost escalation	2.65%	per year
Peak Load (Weather Normalized)	6,683	MW
Peak Load Growth (10yr)	-0.07%	per year

Table 6. Azimuth and Tilt Angles

	Array KW	% of Total	Azimuth	Tilt	
1	4,674	5.9%	51	23	
2	3,523	4.5%	139	22	
3	4,131	5.3%	169	18	
4	23,632	30.1%	180	12	
5	4,588	5.8%	180	21	
6	8,535	10.9%	180	26	
7	9,285	11.8%	180	30	
8	3,798	4.8%	180	35	
9	1,003	1.3%	180	42	
10	5,648	7.2%	180	48	
11	2,153	2.7%	186	24	
12	1,271	1.6%	197	25	
13	2,537	3.2%	212	21	
14	1,674	2.1%	238	24	
15	2,162	2.8%	272	23	
TOTAL	**78,614**	**100%**	**175.2**	**23.0**	**Weighted Average**

Table 8. Economic Value of Avoided Fuel Costs.

				Prices			Costs			Disc. Costs	
Year	Guaranteed NG Price	Burner Tip NG Price	Heat Rate	Utility	VOS	p.u. PV Production	Utility	VOS	Discount Factor	Utility	VOS
	$/mmBtu	$/mmBtu	mmBtu/kWh	$/kWh	$/kWh	(kWh)	($)	($)	(risk free)	($)	($)
2021	$2.58	$2.53	7,579	$0.019	$0.0215	1,550	$30	$33	1.000	$30	$33
2022	$2.45	$2.39	7,586	$0.018	$0.0215	1,542	$28	$33	0.998	$28	$33
2023	$2.41	$2.36	7,594	$0.018	$0.0215	1,535	$28	$33	0.995	$27	$33
2024	$2.42	$2.36	7,602	$0.018	$0.0215	1,527	$27	$33	0.991	$27	$33
2025	$2.43	$2.38	7,609	$0.018	$0.0215	1,519	$27	$33	0.986	$27	$32
2026	$2.46	$2.40	7,617	$0.018	$0.0215	1,512	$28	$33	0.979	$27	$32
2027	$2.48	$2.42	7,624	$0.018	$0.0215	1,504	$28	$32	0.970	$27	$31
2028	$2.52	$2.46	7,632	$0.019	$0.0215	1,497	$28	$32	0.959	$27	$31
2029	$2.55	$2.49	7,640	$0.019	$0.0215	1,489	$28	$32	0.950	$27	$30
2030	$2.61	$2.55	7,647	$0.020	$0.0215	1,482	$29	$32	0.940	$27	$30
2031	$2.72	$2.66	7,655	$0.020	$0.0215	1,474	$30	$32	0.929	$28	$29
2032	$2.83	$2.76	7,663	$0.021	$0.0215	1,467	$31	$32	0.918	$28	$29
2033	$2.89	$2.82	7,670	$0.022	$0.0215	1,460	$32	$31	0.906	$29	$28
2034	$2.95	$2.88	7,678	$0.022	$0.0215	1,452	$32	$31	0.894	$29	$28
2035	$3.01	$2.94	7,686	$0.023	$0.0215	1,445	$33	$31	0.881	$29	$27
2036	$3.07	$3.00	7,693	$0.023	$0.0215	1,438	$33	$31	0.867	$29	$27
2037	$3.14	$3.07	7,701	$0.024	$0.0215	1,431	$34	$31	0.853	$29	$26
2038	$3.20	$3.13	7,709	$0.024	$0.0215	1,423	$34	$31	0.838	$29	$26
2039	$3.27	$3.20	7,716	$0.025	$0.0215	1,416	$35	$30	0.823	$29	$25
2040	$3.34	$3.26	7,724	$0.025	$0.0215	1,409	$36	$30	0.807	$29	$24
2041	$3.41	$3.33	7,732	$0.026	$0.0215	1,402	$36	$30	0.791	$29	$24
2042	$3.48	$3.40	7,740	$0.026	$0.0215	1,395	$37	$30	0.778	$29	$23
2043	$3.56	$3.47	7,747	$0.027	$0.0215	1,388	$37	$30	0.765	$29	$23
2044	$3.63	$3.55	7,755	$0.028	$0.0215	1,381	$38	$30	0.752	$29	$22
2045	$3.71	$3.62	7,763	$0.028	$0.0215	1,374	$39	$30	0.739	$29	$22

Validation: Present Value	**$703**	**$703**

Table 9. Economic value of avoided plant O&M - fixed

				Prices			Costs			Disc. Costs	
Year	O&M Fixed	Utility Capacity	PV Capacity	Utility	VOS	p.u. PV Production	Utility	VOS	Discount Factor	Utility	VOS
	$/kW	per unit		$/kWh	$/kWh	(kWh)	($)	($)		($)	($)
2021	$3.55	1.00	1.00	$0.0023	$0.0028	1,550	$3.55	$4.30	1.000	$3.55	$4.30
2022	$3.62	0.999	0.995	$0.0023	$0.0028	1,542	$3.61	$4.28	0.940	$3.39	$4.02
2023	$3.70	0.998	0.990	$0.0024	$0.0028	1,535	$3.67	$4.26	0.884	$3.24	$3.76
2024	$3.77	0.997	0.985	$0.0025	$0.0028	1,527	$3.73	$4.23	0.831	$3.10	$3.52
2025	$3.85	0.996	0.980	$0.0025	$0.0028	1,519	$3.79	$4.21	0.781	$2.96	$3.29
2026	$3.92	0.995	0.975	$0.0026	$0.0028	1,512	$3.85	$4.19	0.735	$2.83	$3.08
2027	$4.00	0.994	0.970	$0.0026	$0.0028	1,504	$3.91	$4.17	0.691	$2.70	$2.88
2028	$4.08	0.993	0.966	$0.0027	$0.0028	1,497	$3.97	$4.15	0.649	$2.58	$2.70
2029	$4.16	0.992	0.961	$0.0028	$0.0028	1,489	$4.03	$4.13	0.611	$2.46	$2.52
2030	$4.25	0.991	0.956	$0.0028	$0.0028	1,482	$4.10	$4.11	0.574	$2.35	$2.36
2031	$4.33	0.990	0.951	$0.0029	$0.0028	1,474	$4.16	$4.09	0.540	$2.25	$2.21
2032	$4.42	0.989	0.946	$0.0030	$0.0028	1,467	$4.23	$4.07	0.508	$2.15	$2.06
2033	$4.51	0.988	0.942	$0.0031	$0.0028	1,460	$4.30	$4.05	0.477	$2.05	$1.93
2034	$4.60	0.987	0.937	$0.0031	$0.0028	1,452	$4.36	$4.03	0.449	$1.96	$1.81
2035	$4.69	0.986	0.932	$0.0032	$0.0028	1,445	$4.43	$4.01	0.422	$1.87	$1.69
2036	$4.69	0.985	0.928	$0.0032	$0.0028	1,438	$4.42	$3.99	0.397	$1.75	$1.58
2037	$4.88	0.984	0.923	$0.0034	$0.0028	1,431	$4.58	$3.97	0.397	$1.81	$1.57
2038	$4.98	0.983	0.918	$0.0034	$0.0028	1,423	$4.65	$3.95	0.351	$1.63	$1.38
2039	$5.08	0.982	0.914	$0.0035	$0.0028	1,416	$4.72	$3.93	0.330	$1.56	$1.29
2040	$5.18	0.981	0.909	$0.0036	$0.0028	1,409	$4.80	$3.91	0.310	$1.49	$1.21
2041	$5.28	0.980	0.905	$0.0037	$0.0028	1,402	$4.87	$3.89	0.291	$1.42	$1.13
2042	$5.39	0.979	0.900	$0.0038	$0.0028	1,395	$4.95	$3.87	0.274	$1.36	$1.06
2043	$5.49	0.978	0.896	$0.0039	$0.0028	1,388	$5.03	$3.85	0.258	$1.30	$0.99
2044	$5.60	0.977	0.891	$0.0040	$0.0028	1,381	$5.11	$3.83	0.242	$1.24	$0.93
2045	$5.72	0.976	0.887	$0.0041	$0.0028	1,374	$5.19	$3.81	0.228	$1.18	$0.87
					$0.0028						
									Validation: Present Value	$54	$54

Table 10. Economic value of avoided plant O&M - variable

	Prices			Costs			Disc. Costs	
Year	Utility	VOS	p.u. PV Production	Utility	VOS	Discount Factor	Utility	VOS
	$/kWh	$/kWh	(kWh)	($)	($)	(risk free)	($)	($)
2021	$0.0010	$0.0013	1,550	$2	$2	1.000	$2	$2
2022	$0.0011	$0.0013	1,542	$2	$2	0.940	$2	$2
2023	$0.0011	$0.0013	1,535	$2	$2	0.884	$1	$2
2024	$0.0011	$0.0013	1,527	$2	$2	0.831	$1	$2
2025	$0.0011	$0.0013	1,519	$2	$2	0.781	$1	$1
2026	$0.0012	$0.0013	1,512	$2	$2	0.735	$1	$1
2027	$0.0012	$0.0013	1,504	$2	$2	0.691	$1	$1
2028	$0.0012	$0.0013	1,497	$2	$2	0.649	$1	$1
2029	$0.0012	$0.0013	1,489	$2	$2	0.611	$1	$1
2030	$0.0013	$0.0013	1,482	$2	$2	0.574	$1	$1
2031	$0.0013	$0.0013	1,474	$2	$2	0.540	$1	$1
2032	$0.0013	$0.0013	1,467	$2	$2	0.508	$1	$1
2033	$0.0013	$0.0013	1,460	$2	$2	0.477	$1	$1
2034	$0.0014	$0.0013	1,452	$2	$2	0.449	$1	$1
2035	$0.0014	$0.0013	1,445	$2	$2	0.422	$1	$1
2036	$0.0014	$0.0013	1,438	$2	$2	0.397	$1	$1
2037	$0.0014	$0.0013	1,431	$2	$2	0.373	$1	$1
2038	$0.0015	$0.0013	1,423	$2	$2	0.351	$1	$1
2039	$0.0015	$0.0013	1,416	$2	$2	0.330	$1	$1
2040	$0.0015	$0.0013	1,409	$2	$2	0.310	$1	$1
2041	$0.0016	$0.0013	1,402	$2	$2	0.291	$1	$1
2042	$0.0016	$0.0013	1,395	$2	$2	0.274	$1	$0
2043	$0.0016	$0.0013	1,388	$2	$2	0.258	$1	$0
2044	$0.0017	$0.0013	1,381	$2	$2	0.242	$1	$0
2045	$0.0017	$0.0013	1,374	$2	$2	0.228	$1	$0

Validation: Present Value	**$24**	**$24**

Table 11. Economic value of avoided generation capacity cost.

				Prices			Costs			Disc. Costs	
Year	Capacity Cost	Utility Capacity	PV Capacity	Utility	VOS	PV Production	Utility	VOS	Discount Factor	Utility	VOS
	$/kW-yr	pu.	kW	$/kWh	$/kWh	(kWh)	($)	($)		($)	($)
2021	$61	1.00	1.00	$0.039	$0.0395	1,550	$61	$61	1.000	$61	$61
2022	$61	0.999	0.995	$0.039	$0.0395	1,542	$61	$61	0.940	$57	$57
2023	$61	0.998	0.990	$0.039	$0.0395	1,535	$60	$61	0.884	$53	$54
2024	$61	0.997	0.985	$0.039	$0.0395	1,527	$60	$60	0.831	$50	$50
2025	$61	0.996	0.980	$0.039	$0.0395	1,519	$60	$60	0.781	$47	$47
2026	$61	0.995	0.975	$0.039	$0.0395	1,512	$60	$60	0.735	$44	$44
2027	$61	0.994	0.970	$0.039	$0.0395	1,504	$59	$59	0.691	$41	$41
2028	$61	0.993	0.966	$0.039	$0.0395	1,497	$59	$59	0.649	$38	$38
2029	$61	0.992	0.961	$0.040	$0.0395	1,489	$59	$59	0.611	$36	$36
2030	$61	0.991	0.956	$0.040	$0.0395	1,482	$59	$59	0.574	$34	$34
2031	$61	0.990	0.951	$0.040	$0.0395	1,474	$58	$58	0.540	$32	$31
2032	$61	0.989	0.946	$0.040	$0.0395	1,467	$58	$58	0.508	$29	$29
2033	$61	0.988	0.942	$0.040	$0.0395	1,460	$58	$58	0.477	$28	$28
2034	$61	0.987	0.937	$0.040	$0.0395	1,452	$58	$57	0.449	$26	$26
2035	$61	0.986	0.932	$0.040	$0.0395	1,445	$57	$57	0.422	$24	$24
2036	$61	0.985	0.928	$0.040	$0.0395	1,438	$57	$57	0.397	$23	$23
2037	$61	0.984	0.923	$0.040	$0.0395	1,431	$57	$57	0.373	$21	$21
2038	$61	0.983	0.918	$0.040	$0.0395	1,423	$57	$56	0.351	$20	$20
2039	$61	0.982	0.914	$0.040	$0.0395	1,416	$57	$56	0.330	$19	$18
2040	$61	0.981	0.909	$0.040	$0.0395	1,409	$56	$56	0.310	$17	$17
2041	$61	0.980	0.905	$0.040	$0.0395	1,402	$56	$55	0.291	$16	$16
2042	$61	0.979	0.900	$0.040	$0.0395	1,395	$56	$55	0.274	$15	$15
2043	$61	0.978	0.896	$0.040	$0.0395	1,388	$56	$55	0.258	$14	$14
2044	$61	0.977	0.891	$0.040	$0.0395	1,381	$55	$55	0.242	$13	$13
2045	$61	0.976	0.887	$0.040	$0.0395	1,374	$55	$54	0.228	$13	$12
					$0.0395						
									Validation: Present Value	$771	$771

Table 12. Economic value of avoided reserve capacity cost.

					Prices			Costs			Disc. Costs	
Year	Capacity Cost	Reserve Margin	Utility Capacity	PV Capacity	Utility	VOS	PV Production	Utility	VOS	Discount Factor	Utility	VOS
	$/kW-yr	%	pu.	kW	$/kWh	$/kWh	(kWh)	($)	($)		($)	($)
2021	$61	8.9%	1.00	1.00	$0.003	$0.0035	1,550	$5	$5	1.000	$5	$5
2022	$61	8.9%	0.999	0.995	$0.003	$0.0035	1,542	$5	$5	0.940	$5	$5
2023	$61	8.9%	0.998	0.990	$0.003	$0.0035	1,535	$5	$5	0.884	$5	$5
2024	$61	8.9%	0.997	0.985	$0.003	$0.0035	1,527	$5	$5	0.831	$4	$4
2025	$61	8.9%	0.996	0.980	$0.004	$0.0035	1,519	$5	$5	0.781	$4	$4
2026	$61	8.9%	0.995	0.975	$0.004	$0.0035	1,512	$5	$5	0.735	$4	$4
2027	$61	8.9%	0.994	0.970	$0.004	$0.0035	1,504	$5	$5	0.691	$4	$4
2028	$61	8.9%	0.993	0.966	$0.004	$0.0035	1,497	$5	$5	0.649	$3	$3
2029	$61	8.9%	0.992	0.961	$0.004	$0.0035	1,489	$5	$5	0.611	$3	$3
2030	$61	8.9%	0.991	0.956	$0.004	$0.0035	1,482	$5	$5	0.574	$3	$3
2031	$61	8.9%	0.990	0.951	$0.004	$0.0035	1,474	$5	$5	0.540	$3	$3
2032	$61	8.9%	0.989	0.946	$0.004	$0.0035	1,467	$5	$5	0.508	$3	$3
2033	$61	8.9%	0.988	0.942	$0.004	$0.0035	1,460	$5	$5	0.477	$2	$2
2034	$61	8.9%	0.987	0.937	$0.004	$0.0035	1,452	$5	$5	0.449	$2	$2
2035	$61	8.9%	0.986	0.932	$0.004	$0.0035	1,445	$5	$5	0.422	$2	$2
2036	$61	8.9%	0.985	0.928	$0.004	$0.0035	1,438	$5	$5	0.397	$2	$2
2037	$61	8.9%	0.984	0.923	$0.004	$0.0035	1,431	$5	$5	0.373	$2	$2
2038	$61	8.9%	0.983	0.918	$0.004	$0.0035	1,423	$5	$5	0.351	$2	$2
2039	$61	8.9%	0.982	0.914	$0.004	$0.0035	1,416	$5	$5	0.330	$2	$2
2040	$61	8.9%	0.981	0.909	$0.004	$0.0035	1,409	$5	$5	0.310	$2	$2
2041	$61	8.9%	0.980	0.905	$0.004	$0.0035	1,402	$5	$5	0.291	$1	$1
2042	$61	8.9%	0.979	0.900	$0.004	$0.0035	1,395	$5	$5	0.274	$1	$1
2043	$61	8.9%	0.978	0.896	$0.004	$0.0035	1,388	$5	$5	0.258	$1	$1
2044	$61	8.9%	0.977	0.891	$0.004	$0.0035	1,381	$5	$5	0.242	$1	$1
2045	$61	8.9%	0.976	0.887	$0.004	$0.0035	1,374	$5	$5	0.228	$1	$1
						$0.0035						
										Validation: Present Value	$69	$69

Table 13. Economic value of avoided transmission capacity cost.

				Prices			Costs			Disc. Costs	
Year	Capacity Cost	Utility Capacity	PV Capacity	Utility	VOS	PV Production	Utility	VOS	Discount Factor	Utility	VOS
	$/kW-yr	pu.	kW	$/kWh	$/kWh	(kWh)	($)	($)		($)	($)
2021	$50	1.00	1.00	$0.032	$0.0325	1,550	$50	$50	1.000	$50	$50
2022	$50	0.999	0.995	$0.032	$0.0325	1,542	$50	$50	0.940	$47	$47
2023	$50	0.998	0.990	$0.032	$0.0325	1,535	$50	$50	0.884	$44	$44
2024	$50	0.997	0.985	$0.032	$0.0325	1,527	$49	$50	0.831	$41	$41
2025	$50	0.996	0.980	$0.032	$0.0325	1,519	$49	$49	0.781	$38	$39
2026	$50	0.995	0.975	$0.032	$0.0325	1,512	$49	$49	0.735	$36	$36
2027	$50	0.994	0.970	$0.032	$0.0325	1,504	$49	$49	0.691	$34	$34
2028	$50	0.993	0.966	$0.032	$0.0325	1,497	$49	$49	0.649	$32	$32
2029	$50	0.992	0.961	$0.033	$0.0325	1,489	$48	$48	0.611	$30	$30
2030	$50	0.991	0.956	$0.033	$0.0325	1,482	$48	$48	0.574	$28	$28
2031	$50	0.990	0.951	$0.033	$0.0325	1,474	$48	$48	0.540	$26	$26
2032	$50	0.989	0.946	$0.033	$0.0325	1,467	$48	$48	0.508	$24	$24
2033	$50	0.988	0.942	$0.033	$0.0325	1,460	$48	$47	0.477	$23	$23
2034	$50	0.987	0.937	$0.033	$0.0325	1,452	$47	$47	0.449	$21	$21
2035	$50	0.986	0.932	$0.033	$0.0325	1,445	$47	$47	0.422	$20	$20
2036	$50	0.985	0.928	$0.033	$0.0325	1,438	$47	$47	0.397	$19	$19
2037	$50	0.984	0.923	$0.033	$0.0325	1,431	$47	$47	0.373	$17	$17
2038	$50	0.983	0.918	$0.033	$0.0325	1,423	$47	$46	0.351	$16	$16
2039	$50	0.982	0.914	$0.033	$0.0325	1,416	$46	$46	0.330	$15	$15
2040	$50	0.981	0.909	$0.033	$0.0325	1,409	$46	$46	0.310	$14	$14
2041	$50	0.980	0.905	$0.033	$0.0325	1,402	$46	$46	0.291	$13	$13
2042	$50	0.979	0.900	$0.033	$0.0325	1,395	$46	$45	0.274	$13	$12
2043	$50	0.978	0.896	$0.033	$0.0325	1,388	$46	$45	0.258	$12	$12
2044	$50	0.977	0.891	$0.033	$0.0325	1,381	$46	$45	0.242	$11	$11
2045	$50	0.976	0.887	$0.033	$0.0325	1,374	$45	$45	0.228	$10	$10
					$0.0325						
									Validation: Present Value	$634	$634

Table 14. Determination of deferrable distribution costs.

Year	Distribution Project Costs	% Capacity Related	Capacity Related		
	$	%	$		
2019	175,490,525	4.5%	7,812,185		
2018	155,018,178	6.6%	10,270,204		
2017	165,929,956	9.6%	15,936,132		
2016	134,867,264	12.1%	16,309,114		
2015	129,899,465	16.3%	21,147,768		
2014	142,118,822	20.3%	28,825,462		
2013	109,286,058	20.8%	22,683,879		
2012	100,102,075	7.5%	7,502,291		
2011	98,267,667	11.0%	10,823,959		
2010	82,821,606	10.6%	8,749,417		
TOTAL 10-YEAR PERIOD	1,293,801,616		150,060,411		

Table 15. Economic value of avoided distribution capacity cost.

		Conventional Distribution Planning				Deferred Distribution Planning			
Year	**Distribution Cost**	**New Dist. Capacity**	**Capital Cost**	**Disc Capital Cost**	**Amortized**	**Def. Dist. Capacity**	**Def. Capital Cost**	**Disc Capital Cost**	**Amortized**
	$/kW-yr	(MW)	($M)	($M)	$M/yr	(MW)	($M)	($M)	$M/yr
2021	$248	50	$12	$12	$17				$16
2022	$255	50	$13	$12	$17	50	$12.7	$12.0	$16
2023	$262	50	$13	$12	$17	50	$13.1	$11.6	$16
2024	$269	50	$13	$11	$17	50	$13.4	$11.1	$16
2025	$276	50	$14	$11	$17	50	$13.8	$10.7	$16
2026	$283	50	$14	$10	$17	50	$14.1	$10.4	$16
2027	$290	50	$14	$10	$17	50	$14.5	$10.0	$16
2028	$298	50	$15	$10	$17	50	$14.8	$9.6	$16
2029	$306	50	$15	$9	$17	50	$15.2	$9.3	$16
2030	$314	50	$16	$9	$17	50	$15.6	$9.0	$16
2031	$323	50	$16	$9	$17	50	$16.0	$8.6	$16
2032	$331	50	$16	$8	$17	50	$16.4	$8.3	$16
2033	$340	50	$17	$8	$17	50	$16.9	$8.0	$16
2034	$349	50	$17	$8	$17	50	$17.3	$7.8	$16
2035	$358	49	$18	$7	$17	50	$17.7	$7.5	$16
2036	$368	49	$18	$7	$17	49	$18.2	$7.2	$16
2037	$377	49	$19	$7	$17	49	$18.7	$7.0	$16
2038	$387	49	$19	$7	$17	49	$19.1	$6.7	$16
2039	$398	49	$20	$6	$17	49	$19.6	$6.5	$16
2040	$408	49	$20	$6	$17	49	$20.1	$6.2	$16
2041	$419	49	$21	$6	$17	49	$20.7	$6.0	$16
2042	$430	49	$21	$6	$17	49	$21.2	$5.8	$16
2043	$441	49	$22	$6	$17	49	$21.7	$5.6	$16
2044	$453	49	$22	$5	$17	49	$22.3	$5.4	$16
2045	$465	49	$23	$5	$17	49	$22.9	$5.2	$16
2039	$477					49	$23.4	$5.0	
				$208				$201	

Continued - Table 15. Economic value of avoided distribution capacity cost. *EXAMPLE*

Prices			Costs			Disc. Costs	
Utility	VOS	PV Production	Utility	VOS	Discount Factor	Utility	VOS
$/kWh	$/kWh	(kWh)	($)	($)		($)	($)
$0.00757	$0.0080	1,550	$12	$12	1.000	$12	$12
$0.00761	$0.0080	1,542	$12	$12	0.940	$11	$12
$0.00766	$0.0080	1,535	$12	$12	0.884	$10	$11
$0.00770	$0.0080	1,527	$12	$12	0.831	$10	$10
$0.00775	$0.0080	1,519	$12	$12	0.781	$9	$9
$0.00779	$0.0080	1,512	$12	$12	0.735	$9	$9
$0.00784	$0.0080	1,504	$12	$12	0.691	$8	$8
$0.00788	$0.0080	1,497	$12	$12	0.649	$8	$8
$0.00793	$0.0080	1,489	$12	$12	0.611	$7	$7
$0.00797	$0.0080	1,482	$12	$12	0.574	$7	$7
$0.00802	$0.0080	1,474	$12	$12	0.540	$6	$6
$0.00806	$0.0080	1,467	$12	$12	0.508	$6	$6
$0.00811	$0.0080	1,460	$12	$12	0.477	$6	$6
$0.00816	$0.0080	1,452	$12	$12	0.449	$5	$5
$0.00821	$0.0080	1,445	$12	$12	0.422	$5	$5
$0.00825	$0.0080	1,438	$12	$11	0.397	$5	$5
$0.00830	$0.0080	1,431	$12	$11	0.373	$4	$4
$0.00835	$0.0080	1,423	$12	$11	0.351	$4	$4
$0.00840	$0.0080	1,416	$12	$11	0.330	$4	$4
$0.00845	$0.0080	1,409	$12	$11	0.310	$4	$3
$0.00849	$0.0080	1,402	$12	$11	0.291	$3	$3
$0.00854	$0.0080	1,395	$12	$11	0.274	$3	$3
$0.00859	$0.0080	1,388	$12	$11	0.258	$3	$3
$0.00864	$0.0080	1,381	$12	$11	0.242	$3	$3
$0.00869	$0.0080	1,374	$12	$11	0.228	$3	$2
					-		
	$0.0080				**Validation: Present Value**	$155	$155

Table 17. Economic value of avoided environmental costs

Environmental Discount Rate 5.17%

			Prices			Costs			Disc. Costs	
Year	Env. Cost	Solar Weighted Heat Rate	Utility	VOS	p.u. PV Production	Utility	VOS	Discount Factor	Utility	VOS
	$/mmBtu	mmBtu/MWh	$/kWh	$/kWh	(kWh)	($)	($)	(risk free)	($)	($)
2021	$3.17	7,579	$0.024	$0.0353	1,550	$37	$55	1.000	$37	$55
2022	$3.29	7,586	$0.025	$0.0353	1,542	$38	$54	0.951	$37	$52
2023	$3.41	7,594	$0.026	$0.0353	1,535	$40	$54	0.904	$36	$49
2024	$3.54	7,602	$0.027	$0.0353	1,527	$41	$54	0.860	$35	$46
2025	$3.68	7,609	$0.028	$0.0353	1,519	$43	$54	0.817	$35	$44
2026	$3.81	7,617	$0.029	$0.0353	1,512	$44	$53	0.777	$34	$41
2027	$3.95	7,624	$0.030	$0.0353	1,504	$45	$53	0.739	$34	$39
2028	$4.10	7,632	$0.031	$0.0353	1,497	$47	$53	0.703	$33	$37
2029	$4.25	7,640	$0.032	$0.0353	1,489	$48	$53	0.668	$32	$35
2030	$4.40	7,647	$0.034	$0.0353	1,482	$50	$52	0.635	$32	$33
2031	$4.58	7,655	$0.035	$0.0353	1,474	$52	$52	0.604	$31	$31
2032	$4.76	7,663	$0.036	$0.0353	1,467	$53	$52	0.574	$31	$30
2033	$4.95	7,670	$0.038	$0.0353	1,460	$55	$51	0.546	$30	$28
2034	$5.14	7,678	$0.039	$0.0353	1,452	$57	$51	0.519	$30	$27
2035	$5.34	7,686	$0.041	$0.0353	1,445	$59	$51	0.494	$29	$25
2036	$5.54	7,693	$0.043	$0.0353	1,438	$61	$51	0.469	$29	$24
2037	$5.75	7,701	$0.044	$0.0353	1,431	$63	$50	0.446	$28	$23
2038	$5.97	7,709	$0.046	$0.0353	1,423	$65	$50	0.424	$28	$21
2039	$6.19	7,716	$0.048	$0.0353	1,416	$68	$50	0.403	$27	$20
2040	$6.42	7,724	$0.050	$0.0353	1,409	$70	$50	0.384	$27	$19
2041	$6.64	7,732	$0.051	$0.0353	1,402	$72	$49	0.365	$26	$18
2042	$6.86	7,740	$0.053	$0.0353	1,395	$74	$49	0.347	$26	$17
2043	$7.09	7,747	$0.055	$0.0353	1,388	$76	$49	0.330	$25	$16
2044	$7.32	7,755	$0.057	$0.0353	1,381	$78	$49	0.313	$25	$15
2045	$7.57	7,763	$0.059	$0.0353	1,374	$81	$48	0.298	$24	$14
							Validation: Present Value		$760	$760

Table 18. Calculation of inflation-adjusted VOS

Year	Discount Factor	PV Production	Escallation Factor	VOS Levelized	Disc.	**VOS Inflation Adj. ($/kWh)**	Disc
2021	1.000	1550	1.000	$0.110	$171	$0.0911	141.260
2022	0.940	1542	1.021	$0.110	$160	$0.0931	134.938
2023	0.884	1535	1.043	$0.110	$150	$0.0950	128.898
2024	0.831	1527	1.065	$0.110	$140	$0.0970	123.129
2025	0.781	1519	1.087	$0.110	$131	$0.0991	117.618
2026	0.735	1512	1.110	$0.110	$123	$0.1012	112.353
2027	0.691	1504	1.133	$0.110	$115	$0.1033	107.324
2028	0.649	1497	1.157	$0.110	$107	$0.1055	102.521
2029	0.611	1489	1.182	$0.110	$100	$0.1077	97.932
2030	0.574	1482	1.207	$0.110	$94	$0.1100	93.549
2031	0.540	1474	1.232	$0.110	$88	$0.1123	89.362
2032	0.508	1467	1.258	$0.110	$82	$0.1147	85.362
2033	0.477	1460	1.285	$0.110	$77	$0.1171	81.541
2034	0.449	1452	1.312	$0.110	$72	$0.1196	77.891
2035	0.422	1445	1.340	$0.110	$67	$0.1221	74.405
2036	0.397	1438	1.368	$0.110	$63	$0.1247	71.075
2037	0.397	1431	1.397	$0.110	$63	$0.1273	72.212
2038	0.351	1423	1.426	$0.110	$55	$0.1300	64.855
2039	0.330	1416	1.456	$0.110	$52	$0.1327	61.952
2040	0.310	1409	1.487	$0.110	$48	$0.1355	59.179
2041	0.291	1402	1.518	$0.110	$45	$0.1384	56.530
2042	0.274	1395	1.550	$0.110	$42	$0.1413	54.000
2043	0.258	1388	1.583	$0.110	$39	$0.1443	51.583
2044	0.242	1381	1.616	$0.110	$37	$0.1473	49.274
2045	0.228	1374	1.651	$0.110	$35	$0.1504	47.069
					$2,156		$2,156

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2019 VOS VINTAGE YEAR BILL CREDIT RATE

The table below shows the 2019 VOS Vintage Year Bill Credit Rates. These are applicable to applications Deemed Complete from March 26, 2019 until the 2020 VOS Vintage Year Bill Credit Rate table is effective.

Year Number	2019 VOS Vintage Year Bill Credit Rate ($/kWh)		Year Number	2019 VOS Vintage Year Bill Credit Rate ($/kWh)
Year 1	$0.0904		Year 14	$0.1208
Year 2	$0.0925		Year 15	$0.1235
Year 3	$0.0945		Year 16	$0.1263
Year 4	$0.0967		Year 17	$0.1291
Year 5	$0.0988		Year 18	$0.1320
Year 6	$0.1011		Year 19	$0.1350
Year 7	$0.1033		Year 20	$0.1380
Year 8	$0.1057		Year 21	$0.1411
Year 9	$0.1080		Year 22	$0.1443
Year 10	$0.1105		Year 23	$0.1475
Year 11	$0.1130		Year 24	$0.1509
Year 12	$0.1155		Year 25	$0.1542
Year 13	$0.1181			

2020 VOS VINTAGE YEAR BILL CREDIT RATE

The table below shows the 2020 VOS Vintage Year Bill Credit Rates. These are applicable to applications Deemed Complete from March 9, 2020 until the 2021 VOS Vintage Year Bill Credit Rate table is effective.

Year Number	2020 VOS Vintage Year Bill Credit Rate ($/kWh)		Year Number	2020 VOS Vintage Year Bill Credit Rate ($/kWh)
Year 1	$0.0940		Year 14	$0.1252
Year 2	$0.0961		Year 15	$0.1280
Year 3	$0.0983		Year 16	$0.1309
Year 4	$0.1005		Year 17	$0.1338
Year 5	$0.1027		Year 18	$0.1368
Year 6	$0.1050		Year 19	$0.1398
Year 7	$0.1073		Year 20	$0.1430
Year 8	$0.1097		Year 21	$0.1461
Year 9	$0.1122		Year 22	$0.1494
Year 10	$0.1147		Year 23	$0.1527
Year 11	$0.1172		Year 24	$0.1561
Year 12	$0.1198		Year 25	$0.1596
Year 13	$0.1225			

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(Continued on Sheet No. 9-~~65~~64.103)

2021 VOS VINTAGE YEAR BILL CREDIT RATE

The table below shows the 2021 VOS Vintage Year Bill Credit Rates. These are applicable to applications Deemed Complete from [*the effective date of the tariff sheet for these rates following Commission Order]* until the 2022 VOS Vintage Year Bill Credit Rate table is effective.

N

Year Number	2021 VOS Vintage Year Bill Credit Rate ($/kWh)		Year Number	2021 VOS Vintage Year Bill Credit Rate ($/kWh)
Year 1	$0.0911		Year 14	$0.1196
Year 2	$0.0931		Year 15	$0.1221
Year 3	$0.0950		Year 16	$0.1247
Year 4	$0.0970		Year 17	$0.1273
Year 5	$0.0991		Year 18	$0.1300
Year 6	$0.1012		Year 19	$0.1327
Year 7	$0.1033		Year 20	$0.1355
Year 8	$0.1055		Year 21	$0.1384
Year 9	$0.1077		Year 22	$0.1413
Year 10	$0.1100		Year 23	$0.1443
Year 11	$0.1123		Year 24	$0.1473
Year 12	$0.1147		Year 25	$0.1504
Year 13	$0.1171			

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(Continued on Sheet No. 9-65)

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2019 VOS VINTAGE YEAR BILL CREDIT RATE

The table below shows the 2019 VOS Vintage Year Bill Credit Rates. These are applicable to applications Deemed Complete from March 26, 2019 until the 2020 VOS Vintage Year Bill Credit Rate table is effective.

Year Number	2019 VOS Vintage Year Bill Credit Rate ($/kWh)		Year Number	2019 VOS Vintage Year Bill Credit Rate ($/kWh)
Year 1	$0.0904		Year 14	$0.1208
Year 2	$0.0925		Year 15	$0.1235
Year 3	$0.0945		Year 16	$0.1263
Year 4	$0.0967		Year 17	$0.1291
Year 5	$0.0988		Year 18	$0.1320
Year 6	$0.1011		Year 19	$0.1350
Year 7	$0.1033		Year 20	$0.1380
Year 8	$0.1057		Year 21	$0.1411
Year 9	$0.1080		Year 22	$0.1443
Year 10	$0.1105		Year 23	$0.1475
Year 11	$0.1130		Year 24	$0.1509
Year 12	$0.1155		Year 25	$0.1542
Year 13	$0.1181			

2020 VOS VINTAGE YEAR BILL CREDIT RATE

The table below shows the 2020 VOS Vintage Year Bill Credit Rates. These are applicable to applications Deemed Complete from March 9, 2020 until the 2021 VOS Vintage Year Bill Credit Rate table is effective.

Year Number	2020 VOS Vintage Year Bill Credit Rate ($/kWh)		Year Number	2020 VOS Vintage Year Bill Credit Rate ($/kWh)
Year 1	$0.0940		Year 14	$0.1252
Year 2	$0.0961		Year 15	$0.1280
Year 3	$0.0983		Year 16	$0.1309
Year 4	$0.1005		Year 17	$0.1338
Year 5	$0.1027		Year 18	$0.1368
Year 6	$0.1050		Year 19	$0.1398
Year 7	$0.1073		Year 20	$0.1430
Year 8	$0.1097		Year 21	$0.1461
Year 9	$0.1122		Year 22	$0.1494
Year 10	$0.1147		Year 23	$0.1527
Year 11	$0.1172		Year 24	$0.1561
Year 12	$0.1198		Year 25	$0.1596
Year 13	$0.1225			

(Continued on Sheet No. 9-64.103)

2021 VOS VINTAGE YEAR BILL CREDIT RATE

The table below shows the 2021 VOS Vintage Year Bill Credit Rates. These are applicable to applications Deemed Complete from [*the effective date of the tariff sheet for these rates following Commission Order]* until the 2022 VOS Vintage Year Bill Credit Rate table is effective.

N

Year Number	2021 VOS Vintage Year Bill Credit Rate ($/kWh)		Year Number	2021 VOS Vintage Year Bill Credit Rate ($/kWh)
Year 1	$0.0911		Year 14	$0.1196
Year 2	$0.0931		Year 15	$0.1221
Year 3	$0.0950		Year 16	$0.1247
Year 4	$0.0970		Year 17	$0.1273
Year 5	$0.0991		Year 18	$0.1300
Year 6	$0.1012		Year 19	$0.1327
Year 7	$0.1033		Year 20	$0.1355
Year 8	$0.1055		Year 21	$0.1384
Year 9	$0.1077		Year 22	$0.1413
Year 10	$0.1100		Year 23	$0.1443
Year 11	$0.1123		Year 24	$0.1473
Year 12	$0.1147		Year 25	$0.1504
Year 13	$0.1171			

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(Continued on Sheet No. 9-65)

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CERTIFICATE OF SERVICE

I, Paget Pengelly, hereby certify that I have this day served copies or summaries of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States Mail at Minneapolis, Minnesota

xx electronic filing

Docket No. E002/M-13-867

Dated this 1st day of September 2020

/s/

_____

Paget Pengelly
Regulatory Administrator

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Jeffrey C	Paulson	jeff.jcplaw@comcast.net	Paulson Law Office, Ltd.	4445 W 77th Street Suite 224 Edina, MN 55435	Electronic Service	No	OFF_SL_13-867_Official

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Matthew	Pelikan	mpelikan@madellaw.com	Madel PA	800 Pence Bldg 800 Hennepin Ave Minneapolis, MN 55403	Electronic Service	No	OFF_SL_13-867_Official
Joyce	Peppin	joyce@mrea.org	Minnesota Rural Electric Association	11640 73rd Ave N Maple Grove, MN 55369	Electronic Service	No	OFF_SL_13-867_Official
Generic Notice	Residential Utilities Division	residential.utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012131	Electronic Service	Yes	OFF_SL_13-867_Official
Isabel	Ricker	ricker@fresh-energy.org	Fresh Energy	408 Saint Peter Street Suite 220 Saint Paul, MN 55102	Electronic Service	No	OFF_SL_13-867_Official
Jonathan	Roberts	jroberts@soltage.com	Soltage	66 York St 5th Floor Jersey City, NJ 07302	Electronic Service	No	OFF_SL_13-867_Official
Will	Seuffert	Will.Seuffert@state.mn.us	Public Utilities Commission	121 7th Pl E Ste 350 Saint Paul, MN 55101	Electronic Service	Yes	OFF_SL_13-867_Official
David	Shaffer	shaff081@gmail.com	Minnesota Solar Energy Industries Project	1005 Fairmount Ave Saint Paul, MN 55105	Electronic Service	No	OFF_SL_13-867_Official
Doug	Shoemaker	dougs@charter.net	Minnesota Renewable Energy	2928 5th Ave S Minneapolis, MN 55408	Electronic Service	No	OFF_SL_13-867_Official
Russ	Stark	Russ.Stark@ci.stpaul.mn.us	City of St. Paul	390 City Hall 15 West Kellogg Boulevard Saint Paul, MN 55102	Electronic Service	No	OFF_SL_13-867_Official
Eric	Swanson	eswanson@winthrop.com	Winthrop & Weinstine	225 S 6th St Ste 3500 Capella Tower Minneapolis, MN 554024629	Electronic Service	No	OFF_SL_13-867_Official

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
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Lynnette	Sweet	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_13-867_Official
Anna	Tobin	atobin@greeneespel.com	Greene Espel PLLP	222 South Ninth Street Suite 2200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_13-867_Official
Pat	Treseler	pat.jcplaw@comcast.net	Paulson Law Office LTD	4445 W 77th Street Suite 224 Edina, MN 55435	Electronic Service	No	OFF_SL_13-867_Official
John	Vaughn	jvaughn@rreal.org	Rural Renewable Energy Alliance	3963 8th Street SW Backus, MN 55435	Electronic Service	No	OFF_SL_13-867_Official